CLAIMS

1. A method of transmitting data over lines of a power line network, comprising:

inductively inducing substantially opposite polarity currents representing the data, on first and second lines of the network, at a first location along the lines; and

sensing the propagated currents from the first and second lines at a second location along the lines.

2. A method according to claim 1, wherein the power line network is a low voltage power line network and at least one of the first and second lines is electrified with a voltage lower than 300 volts.

3. A method according to claim 1, wherein the power line network is a medium or high voltage power line network and at least one of the first and second lines is electrified with a voltage above about 2 KV.

4. A method according to claim 1, wherein the substantially opposite polarity currents are substantially equal in amplitude.

5. A method according to claim 1, wherein inducing substantially opposite polarity currents comprises inducing currents having a phase difference of at least 170° substantially throughout the duration of transmission of the data.

6. A method according to claim 1, wherein inducing substantially opposite polarity currents comprises inducing currents having a phase difference of at least 175° substantially throughout the duration of transmission of the data.

7. A method according to claim 1, comprising coupling a first magnetic circuit to the first line and a second magnetic circuit to the second line and wherein inducing the currents comprises generating opposite sense changes in the magnetic fields in each of the magnetic circuits, where the senses of the magnetic fields in the first and second magnetic circuits are determined relative to same sense directions along the first and second lines respectively.

8. A method according to claim 7, wherein the first and second magnetic circuits comprise magnetically permeable first and second cores.

9. A method according to claim 7, wherein inductively inducing the opposite polarity currents in the lines comprises inducing currents in first and second rings coupled around the first and second lines, respectively.

10. A method according to claim 9, wherein inductively inducing currents in the first and second rings comprises inducing currents on one or more wires wound at least one loop around the first and second rings.

11. A method according to claim 10, wherein the one or more wires comprise a single wire for both the first and second rings.

12. A method according to claim 10, wherein the one or more wires comprise separate wires for the first and second rings.

13. A method according to claim 9, wherein the at least one loop wound around the cores comprises a plurality of loops around each of the cores.

14. A method according to claim 13, wherein the current is induced in all the loops of the plurality of loops.

15. A method according to claim 13, wherein the current is induced in only a portion of the loops of the plurality of loops.

16. A method according to claim 15, and comprising sensing opposite polarity currents transmitted along the first and second lines to the first location and wherein sensing a propagated current comprises sensing a change in magnetic flux through all the loops.

17. A method according to claim 10, wherein the number of loops in which the current is induced is less than or equal to four.

18. A method according to claim 13, wherein the number of the plurality of loops is less than or equal to ten.

19. A method according to claim 10, wherein generating opposite sense current changes comprises generating changes in currents that flow in same senses through the at least one loop wound around each of the cores respectively.

20. A method according to claim 10, wherein generating opposite sense current changes comprises generating changes in currents that flow in opposite senses through the at least one loop wound about the cores respectively.

21. A method according to claim 20, wherein generating opposite sense currents comprises winding first and second wires about the first and second magnetic circuits respectively and generating a current change in the first wire and an opposite sense current change in the second wire.

22. A method according to claim 21, wherein generating the opposite sense current changes comprises connecting the ends of the first wire and the ends of the second wire to a signal circuit that generates the current change.

23. A method according to claim 22, wherein each end of the first wire and an end of the second wire are connected to a same terminal connected to the signal circuit.

24. A method according to claim 22, wherein at least one end of each wire is connected to a terminal connected to the signal circuit to which an end of the second wire is not connected.

25. A method according to claim 22, wherein the first and second wires are connected to the circuit via a transformer.

26. A method according to claim 20, wherein generating opposite sense currents comprises winding a same wire in opposite senses about the first at least one magnetic circuit and the second at least one magnetic circuit and generating a change in a current flowing through the wire.

27. A method according to claim 26, wherein generating a change in the current comprises connecting the ends of the wire to a signal circuit that generates the current change.

28. A method according to claim 27, and comprising twisting the wire around itself for a portion of its length between the signal circuit and the cores.

29. A method according to claim 27, wherein connecting the wire to the circuit comprises connecting the wire to the circuit via a transformer.

30. A method according to claim 29, wherein the transformer is a center tapped transformer.

31. A method according to claim 8, wherein mounting the first or second core to a line, comprises:

forming first and second matching segments of the core;

mounting the first and second segments in first and second matching housings respectively;

positioning the housings so that the line is located between the first and second core segments; and

closing the first and second housing to each other so that the first and second segments of the core meet and form a magnetic circuit that surrounds the line.

32. A method according to claim 31, and comprising mounting a line guide to the first segment into which the line is placed to properly position the line between the first and second core segments.

33. A method according to claim 31, wherein the first and second housings are coupled by a bolt that and closing the first and second housing to each other comprises turning the bolt.

34. A method according to claim 33, wherein the line is an overhead line and mounting the at least one core comprises hanging the coupled housings on the line by positioning the first housing so that the housing rests on the line and then turning the bolt.

35. A method according to claim 32, wherein turning the bolt comprises turning the bolt using an insulated tool sufficiently long so that a safe distance from the line may be maintained during mounting.

36. A method according to claim 31, wherein the line is a voltage carrying line that is electrified during mounting.

37. A method according to claim 1, wherein the first and second lines are uninsulated.

38. A method according to claim 1, wherein at least one of the lines is a neutral line.

39. A method according to claim 1, wherein both lines are voltage carrying lines.

40. A method according to claim 1, wherein generating current changes comprises generating current changes characterized by at least one frequency greater than about 2 MHz.

41. Apparatus for transmitting a signal over first and second lines of a power line network, comprising:

a first magnetic circuit adapted to inductively couple to the first line;

a second magnetic circuit adapted to inductively couple to the second line;

an input interface adapted to receive data for transmission; and

a signal circuit adapted to induce electrical signals representative of the received data in both the first and second magnetic circuits, with substantially opposite polarity, concurrently.

42. Apparatus according to claim 41, wherein the first and second magnetic circuits are coupled to the signal circuit through a single wire.

43. Apparatus according to claim 41, wherein the first and second magnetic circuits are coupled to the signal circuit through separate wires.

44. Apparatus according to claim 41, wherein the power line network is a medium or high voltage power line network and at least one of the first and second lines is electrified with a voltage in excess of about 2 KV.

45. Apparatus according to claim 41, wherein the first and second magnetic circuits respectively comprise first at least one and second at least one magnetically permeable cores.

46. Apparatus according to claim 45, wherein each at least one core is wound with at least one loop of a conducting wire connected to the circuit.

47. Apparatus according to claim 46, wherein the at least one loop wound around the first and second core comprises a plurality of loops.

48. Apparatus according to claim 47, wherein the signal circuit generates current changes in all the loops of the plurality of loops.

49. Apparatus according to claim 47, wherein the signal circuit is connected to the plurality of loops so as to generate current changes in a portion of the loops.

50. Apparatus according to claim 49, wherein the signal circuit senses opposite polarity currents representing a signal that are transmitted along the first and second lines to the first location by sensing changes in flux through all the loops wound respectively around the first and second cores.

51. Apparatus according to claim 47, wherein the number of loops in which the current changes are generated is less than or equal to four.

52. Apparatus according to claim 47, wherein the number of the plurality of loops is less than or equal to ten.

53. Apparatus according to claim 46, wherein a same wire is wound about the first and second at least one cores.

54. Apparatus according to claim 53, wherein the sense of the winding of the wire about the first at least one core is opposite to that of the winding of the second at least one core, where the sense of winding about the first and second at least one core is determined relative to same sense directions along the first and second lines respectively.

55. Apparatus according to claim 46, wherein different wires are wound about the first and second at least one cores.

56. Apparatus according to claim 46, wherein the wire is twisted around itself for a portion of its length between the circuit and the magnetic circuit.

57. Apparatus according to claim 41, wherein the wire is connected to the circuit via a transformer.

58. Apparatus according to claim 57, wherein the transformer is a center tapped transformer.

59. Apparatus according to claim 46, wherein each at least one core comprises first and second matching segments which are brought together to form a magnetic circuit so that the magnetic circuit surrounds the line.

60. Apparatus according to claim 59, and comprising first and second matching housings in which the first and second segments are mounted.

61. Apparatus according to claim 60, and comprising a bolt coupled to the first and second housings that can be turned to separate the housings from each other or close the housings to each other so that the first and second segments of the at least one core meet and form the magnetic circuit.

62. Apparatus according to claim 41, wherein the signal circuit generates flux changes characterized by frequencies greater than about 2 MHz.

63. Apparatus for transmitting a signal over a power line network, comprising:

a first coupling circuit adapted to couple to a first line of the network;

a second coupling circuit adapted to couple to a second line of the network;

a signal circuit, including at least one two-terminal port, adapted to transmit or receive electrical signals representative of data transmitted on the first and second lines;

a first wire connected to a two-terminal port of the signal circuit and to the first coupling circuit, so as to transfer signals between the signal circuit and the first coupling circuit; and

a second wire connected to a two-terminal port of the signal circuit and to the second coupling circuit, so as to transfer signals between the signal circuit and the second coupling circuit.

64. Apparatus according to claim 63, wherein the first and second wires are connected to the same two terminal port of the signal circuit.

65. Apparatus according to claim 64, wherein the first and second wires are connected to the same two terminal port of the signal circuit, with opposite orientation.

66. Apparatus according to claim 63, wherein the first coupling circuit comprises an inductive coupling circuit.

67. Apparatus according to claim 66, wherein the first coupling circuit includes a magnetic core and wherein the first wire is wound around the core one or more loops.

68. Apparatus according to claim 67, wherein the first wire comprises a resistor parallel to the one or more loops.

69. Apparatus according to claim 63, wherein the first coupling circuit comprises a capacitive coupling circuit.

70. Apparatus according to claim 63, wherein the first wire comprises a resistor adjacent the first coupling circuit.

71. Apparatus according to claim 63, wherein the resistance of the resistor is substantially equal to the typical resistance of the first wire.

72. A coupler for inductively coupling a circuit to an electrified line, the coupler comprising:

a first part having a first segment of at least one core formed from a magnetically permeable material;

a second part having a second segment of the at least one core that matches the first segment;

a wire, electrically connected to the circuit, that loops around at least one segment of the at least one core at least once; and

a bolt coupled to the first and second parts turnable to separate the first and second parts from each other or close the first and second parts to each other so that the first and second segments of the at least one core meet and form a magnetic circuit that surrounds the line.